



## Original Research

# The Effects of Operation Technique on Recurrence of Incisional Hernia Repair

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### Abstract

**Objectives:** The selection of incision type, closure type of incision and the suture material are some of the important factors to prevent hernia development. We should aim to perform the best procedure with the best technique to reduce the risk of recurrence. Surgical options include primary repair and open or laparoscopic repair with mesh. Mesh repairs can be performed as onlay, sublay or inlay according to the area where the mesh is to be laid. In this retrospective study, our main goal was to compare the recurrence rates in patients who underwent incisional hernia repair with onlay and inlay mesh techniques.

**Methods:** This retrospective study included 185 patients who underwent surgery due to incisional hernia in our clinic between January 2012 and October 2017. Patients were divided into two groups according to the technique as Group 1 with onlay mesh repair and Group 2 with inlay mesh repair. The same type of mesh (prolen) was applied to all patients.

**Results:** There were 121 patients in Group 1 and 64 patients in Group 2. According to data we obtained, 64.3% of the patients were women and the mean age of all patients was  $58.4 \pm 16.4$  years. Postoperative complications (such as seroma-hematoma, surgical site infection, mesh rejection, postoperative ileus) developed in 29.2% (n=54) of the patients. The length of hospital stay was  $4.2 \pm 3$  days in Group 1 and  $5.6 \pm 5$  days in Group 2. The mean follow-up period was 48.6 months (24-93 months), with the recurrence rates of 5.8% (n=7) in Group 1 and 10.9% (n=7) in Group 2, respectively. There was a statistically significant difference between the groups concerning comorbidity, postoperative complications, the length of hospitalization stay and recurrence.

**Conclusion:** We believe that the onlay technique will be more appropriate than the inlay technique when only prolen mesh is preferred because the recurrence rates are higher in the inlay technique.

**Keywords:** Incisional hernia; inlay; onlay; recurrence; surgical technique.

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Incisional hernia (IH) is a common complication after open abdominal surgery and its incidence varies between 2-20% depending on the patient's age, obesity, comorbidity and type of the surgery.<sup>[1, 2]</sup> Incision type, closure of the incision and the suture material are the important factors for preventing hernia development.

Incisional hernias are usually asymptomatic but may cause serious complications, such as abdominal pain, skin deformity, intestinal obstruction, strangulation, incarceration

and enterocutaneous fistula.<sup>[3]</sup> Surgical intervention is indicated to prevent these complications and the expansion of the defect.

Surgical options include primary repair with suture and open or laparoscopic repair with mesh. In mesh repair, onlay, sublay and inlay repairs can be applied according to the area where the mesh will be laid.<sup>[4]</sup> All three techniques are widely used, and there is no definite consensus on which technique is superior. The aim should be to apply the best

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method with the best technique that will lead to the least possibility of recurrence.

In this retrospective study, we aimed to compare the clinical differences and recurrence rates in patients who underwent IH repair with onlay and inlay techniques.

## Methods

This was a retrospective study of 185 patients who underwent surgery due to IH in our clinic between January 2012 and October 2017. Demographics (e.g., sex, age, BMI), clinicopathological features and treatment approaches of the patients were evaluated. To conduct this study, approval from the ethics committee of İzmir Katip Çelebi University Atatürk Training and Research Hospital was obtained (Date: 29.11.2017, Number: 269).

The patients were informed about their disease, options of surgery and which procedure was going to be performed. Informed consent was obtained from all patients regarding the use of their data in this scientific study.

The medical status of each patient was defined using the American Society of Anesthesiologists (ASA) score.

## Patients and Surgical Technique

Patients were consecutively selected. Inclusion criteria were as follows: 1- Patients with an incisional hernia (Fig. 1) (hernia size was not taken into consideration), 2- Patients who underwent open onlay or inlay incisional hernia repair with mesh, 3- Patients who were followed-up regularly.

Exclusion criteria were as follows: 1- Malignancy patients requiring additional intervention, 2- Patients with cirrhot-

ic or abdominal ascites, 3- Patients with abdominal wall loss or non-healing wound, 4- Patients who underwent sublay hernia repair, 5- Patients who underwent laparoscopic hernia repair 5- Patients who underwent primary hernia repair, 6- Patients who could not be contacted for follow-up.

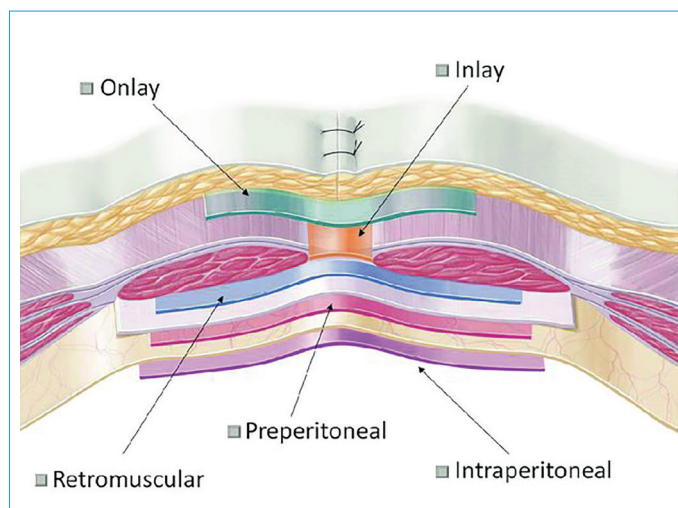
The patients were divided into two groups according to the positioning of mesh: Group 1; onlay hernia repair and Group 2; inlay hernia repair (Fig. 2).

The presence of incisional hernia was diagnosed by physical examination, abdominal ultrasonography and/or computed tomography. Each patient's comorbidities (e.g. diabetes, hypertension, obesity, coronary artery disease (CAD), kidney disease, chronic lung disease) were recorded.

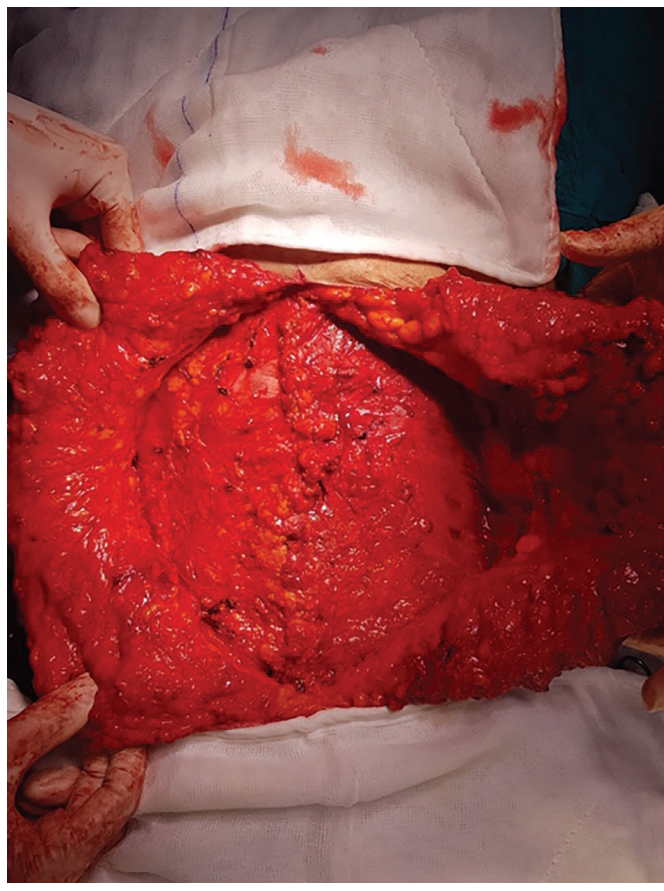
The operations were performed under general, spinal or epidural anesthesia. Single-dose intravenous antibiotics (1<sup>st</sup> generation cephalosporins) prophylaxis before the incision was applied. The skin scar from the previous operation was excised and subcutaneous dissection was performed until the intact fascia appeared. Hernia sac resected in suitable patients. The surgical site was washed with saline and aspirated, bleeding control was performed, and gloves were changed with the new pairs before mesh fixation. Mesh size was chosen according to the hernia size. Mesh was placed on the anterior sheath of the rectus muscle and was fixed with 2-0 prolene sutures after the fascia closure with 1/0 no prolene suture in onlay repair (Fig. 3). Mesh was placed between the anterior sheath and rectus muscle in inlay repair. Same type of mesh (polypropylene) was used in both groups. A double-sided hemovac drain was placed on the mesh and kept in place until the daily drainage was below 25 ml.



**Figure 1.** Giant incisional hernia.



**Figure 2.** Types of the incisional hernia repair according to mesh fixation areas.



**Figure 3.** Closure of the fascia with prolene suture in the onlay repair.

### Follow-up

Patients were discharged after the removal of hemovac drain (when drainage was less than 25ml) without signs of local and systemic inflammation. In rare cases with high-flow drainage, patients were discharged with the hemovac drain and followed closely in short periods. Follow-up was generally performed by the surgeon who performed the operation. Data of patients' current status were obtained through the hospital database and/or telephone interviews with patients.

### Statistical Analysis

Chi-square and Fisher tests were used as statistical methods and  $p < 0.05$  was considered statistically significant.

### Results

A total of 185 patients (121 in Group 1 and 64 in Group 2) were included in this study. Demographics, preoperative and postoperative data among the groups are given in Table 1.

According to these data, 64.3% of the patients were women. The mean age was  $58.4 \pm 16.4$  years, while it was  $59.4 \pm 18$  in Group 1 and  $58 \pm 16$  in Group 2. The mean body mass index (BMI) of all patients was  $37.3 \pm 8.3$  kg/m<sup>2</sup> and the ASA

score was 2.2. In addition, 24.3% of the patients had comorbidity, especially diabetes, hypertension, obesity, CAD and chronic obstructive pulmonary disease. There was no statistically significant difference between the groups concerning BMI and ASA score, while the presence of comorbid disease was higher in Group 1.

The most common type of the incision was lower midline (LM), while the other types were upper midline (UM), LM+UM, subcostal, paramedian, Pfannenstiel and McBurney's. Although the LM incision scar was significantly higher in Group 2, there was no statistically significant difference between the groups concerning incision type.

Postoperative complications (early and late), such as seroma-hematoma, surgical site infection (SSI), mesh rejection, postoperative ileus and others (e.g. pneumonia and deep vein thrombosis), developed in 29.2% (n=54) of the patients. Seroma-hematoma and SSI were more common in Group 1, while postoperative ileus was significantly more common in Group 2, which led to a significant difference between the groups concerning complications. However, there was no difference between the groups concerning overall complication rates.

The length of hospital stay was  $4.2 \pm 3$  days in Group 1 and  $5.6 \pm 5$  days in Group 2. The mean follow-up period was 48.6 months (24-93 months), with the recurrence rates of 5.8% (n=7) in Group 1 and 10.9% (n=7) in Group 2, respectively. There was a statistically significant difference between groups concerning the length of hospital stay and recurrence.

### Discussion

Incisional hernia arises from incomplete or poor wound healing since the beginning. It usually presents with an asymptomatic or painful swelling on the incision scar, which is noticed by the patient. Pain usually occurs in small hernia sacs with a narrow neck. An incisional hernia develops in about one in five patients undergoing abdominal surgery.<sup>[5]</sup> While more than half of the cases are seen in the first two years after the primary surgery, they may also develop years after the operation.<sup>[6]</sup>

Predisposing factors for hernia development include SSI, abdominal distension, the tension in suture line, male gender, advanced age, obesity, emergency surgery and the presence of chronic diseases, such as diabetes. In a study conducted by Bucknallet al., the incidence of hernia was 23% in contaminated wounds, while it was 4.5% for the clean wounds.<sup>[7]</sup>

Incision type is still a controversial issue and besides the studies reporting that incision type does not have an effect on hernia development.<sup>[8]</sup> There are other studies that showed that transverse abdominal incisions had a lower incidence of incisional hernia compared to midline incisions.<sup>[9-11]</sup>

**Table 1.** Demographic, preoperative and postoperative data of the patients

Features	Total (n=185)	Group 1 (n=121)	Group 2 (n=64)	p
Sex (n,%)				
Female	119 (64.3)	79 (65.3)	40 (62.5)	0.801
Male	66 (35.7)	42 (34.7)	24 (37.5)	
Age (year)	58.4±16.4	59.4±18	58±16	0.12
Body Mass Index (BMI) (kg/m <sup>2</sup> )	37.3±8.3	36±7	39±4	0.756
Comorbidity (n, %)	45 (24.3)	36 (29.8)	9 (14.1)	<0.05
ASA score	2.2	2.3	2.1	0.652
Incision type				
UM	29 (15.7)	18 (14.9)	11 (17.2)	0.532
LM	72 (38.8)	43 (35.5)	29 (45.3)	
UM+LM	47 (25.4)	30 (24.8)	17 (26.6)	
Paramedian	14 (7.6)	12 (9.9)	2 (3.1)	
Subcostal	16 (8.7)	12 (9.9)	4 (6.2)	
PF	5 (2.7)	4 (3.3)	1 (1.6)	
McBurney's	2 (1.1)	2 (1.7)	0	
Complication (n, %)				
Seroma-hematoma	24 (13)	19 (15.7)	6 (7.8)	
SSI	7 (3.8)	6 (5)	1 (1.6)	
Mesh rejection	6 (3.2)	4 (3.3)	2 (3.1)	<0.05
Postoperative ileus	10 (5.4)	2 (1.7)	8 (12.5)	
Other	7 (3.8)	5 (4.1)	2 (3.1)	
Total	54 (29.2)	36 (29.8)	19 (29.7)	
Hospitalization time (day)	4.6±3.4	4.2±3	5.6±5	<0.05
Recurrence (n, %)	14 (7.6)	7 (5.8)	7 (10.9)	<0.05

ASA: The American Society of Anesthesiologists, UM: Upper median, LM: Lower median, PF: Pfannenstiel incision, SSI: Surgical site infection

In our patient groups, the rate of female gender was higher, and 24.3% of the patients had at least one comorbidity. The most common incision was LM, and there was no difference between the groups concerning incision type and gender distribution.

Complications, such as seroma, hematoma and wound infection, may develop after incisional hernia repair.<sup>[12]</sup> In the literature, the development of seroma was reported as 0-63% and SSI was reported as 6-12%, which was generally associated with the extensive dissection of subcutaneous tissue and the material of mesh.<sup>[13-16]</sup> Therefore, especially the positioning of the mesh is very effective in reducing the risk of seroma.<sup>[17, 18]</sup>

Milad et al. reported that the retromuscular plane helped to prevent seroma and infection due to its highly vascular structure, and when any infection occurred in the subcutaneous plane, it would not affect the mesh since the mesh was in a deeper plane.<sup>[19]</sup> In many similar studies, postoperative complication rates have been reported to be highest in online hernia repair.<sup>[12, 20]</sup> In our study, seroma-hematoma and SSI were more common in the onlay group, while postoperative

ileus was more common in the inlay group. Surgical closure of the defect is necessary to manage the symptoms and prevent probable serious complications and the expansion of hernia. In patients with high comorbidity and ASA score, "watchfulwaiting" can be considered since they have higher rates of complication and recurrence than normal.<sup>[21, 22]</sup> However, there are also publications reporting that more than 54-72% of the patients who had been under watchfulwaiting may require surgery in the future.<sup>[17, 18]</sup>

A previous study was conducted to evaluate the technique of onlay and sublay mesh repair of incisional hernias with regards to hospital time.<sup>[23]</sup> The mean duration in the sublay group was 4.8 days, compared to 6.68 days in the onlay group. In our study group, the onlay group was 4.2±3 and the inlay group was 5.6±5. This difference was thought to be due to early postoperative ileus.

Recurrence of hernia is a troublesome situation for both patient and surgeon, and tension-free repair with mesh is an ideal technique to reduce the risk for recurrence.<sup>[24]</sup> By the utilization of prolene mesh, recurrence rates have significantly decreased in recent years. Hernias smaller than

2.5 cm can be successfully closed with primary repair, while recurrence is observed up to 30-40% in larger ones. Hesse-linket al. reported a recurrence rate of 41% in patients who had hernia over 4 cm and underwent primary repair.<sup>[25]</sup> Sauerland et al. compared primary repair with mesh repair and found a recurrence rate of 18% to 5%, respectively.<sup>[26]</sup>

Depending on the anatomical positioning of the mesh in the rectus muscle, there are varieties of hernia repair, such as onlay, sublay and inlay. There are many studies on the effect of these methods on recurrence.<sup>[27-30]</sup> DeVries Reilinghet al. compared these three methods and reported less recurrence in the sublay group.<sup>[31]</sup> In the same study, the recurrence rates were reported as 28.3%, 44% and 12% in onlay, inlay and sublay groups, respectively.

In our patient group, recurrence rates were 5.8% (n=7) in the onlay group and 10.9% (n=7) in the inlay group. There was a significant statistical difference between the groups. In addition to its distinguished aspects, there are also few limitations to this study. First, this is a retrospective study. Second, there is a difference between the groups concerning the number of the patients.

## Conclusion

In conclusion, we believe that the onlay technique will be more appropriate than inlay technique when only prolen mesh is preferred because the recurrence rates are higher in the inlay technique. However, it should be kept in mind that postoperative complications, such as seroma, hematoma and wound infection, may be encountered more in the onlay technique.

## Disclosures

**Ethics Committee Approval:** This study was approved from the ethics committee of İzmir Katip Çelebi University Atatürk Training and Research Hospital was obtained (Date: 29.11.2017, Number: 269).

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** The authors have no conflict of interest.

**Authorship Contributions:** Concept – T.A., N.A.; Design – T.A., N.A., Y.S.; Supervision – H.G., E.K., K.A., M.H.; Materials – N.A., Y.S., K.A.; Data collection &/or processing – T.A., Y.S.; Analysis and/or interpretation – K.A., E.K., H.G., M.H.; Literature search – T.A., N.A.; Writing – T.A., N.A.; Critical review – E.K., K.A., H.G., M.H.

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